AMENDMENTS TO THE CLAIMS

Claim 1 (Currently Amended) A voice activity detector using a complex Laplacian statistic module, comprising:

a fast frequency Fourier transformer for performing a fast Fourier transform on input speech to analyze speech signals of a time domain in a frequency domain;

a noise power estimator for estimating a power $\lambda_{n,k}(t)$ of noise signals from noisy speech X(k) of the frequency domain output from the fast frequency Fourier transformer; and

a likelihood ratio test (LRT) calculator for calculating a decision rule of voice activity detection (VAD) from the estimated power $\lambda_{n,k}(t)$ of noise signals from the noise power estimator and a complex Laplacian probabilistic statistical model,

wherein the decision rule is a geometrical average of likelihood ratio Λ_k for the k-th frequency, the likelihood ratio Λ_k being determined by the following equation:

$$\Lambda_k = \frac{p\langle X_k \mid H_1\rangle}{p\langle X_k \mid H_0\rangle}$$

where hypothesis H_0 represents the case of absence of speech; hypothesis H_1 represents the case of presence of speech; and X_k is the k-th discrete Fourier coefficient, and the likelihood ratio using the Laplacian statistic module is determined by the following equation:

$$\Lambda_{k}^{(L)} = \frac{P_L\langle X_k \mid H_1\rangle}{P_L\langle X_k \mid H_0\rangle} = \frac{1}{1+\xi_K}\exp\left\{2\left(|X_{k(R)}|+|X_{k(I)}|\right)\left(\frac{|X_k|-\sqrt{\lambda_{n,k}}}{|X_k|\sqrt{\lambda_{n,k}}}\right)\right\}$$

where $\xi_k = \lambda_{s,k} \mid \lambda_{n,k}$; and $X_{k(R)}$ and $X_{k(I)}$ are a real part and an imaginary part of X_k, respectively.

Claims 2-3 (Canceled)

Claim 4 (Currently Amended) A voice activity detection method using a complex Laplacian statistic module, comprising:

(a) performing a fast Fourier transform on input speech, and generating noisy speech X(k) to analyze speech signals of a time domain in a frequency domain;

(b) estimating a power $\lambda_{n,k}(t)$ of noise signals from the noisy speech X(k) of the frequency domain output in the step (a); and

(c) calculating a decision rule of VAD from the estimated power $\lambda_{n,k}(t)$ of noisy signals and a complex Laplacian probabilistic statistical model,

wherein the decision rule is a geometrical average of a likelihood ratio for the k-th frequency, the likelihood ratio being determined by the following equation:

$$\Lambda_k^{(L)} = \frac{P_L\langle X_k \mid H_1\rangle}{P_L\langle X_k \mid H_0\rangle} = \frac{1}{1+\xi_K}\exp\left\{2\left(\mid X_{k(R)}\mid + \mid X_{k(1)}\mid\right)\left(\frac{\mid X_k\mid - \sqrt{\lambda_{n,k}}}{\mid X_k\mid \sqrt{\lambda_{n,k}}}\right)\right\}$$

where hypothesis H_0 represents the case of absence of speech; hypothesis H_1 represents the case of presence of speech; X_k is the k-th discrete Fourier coefficient; $\xi_k = \lambda_{s,k} / \lambda_{n,k}$; and $X_{k(R)}$ and $X_{k(1)}$ are a real part and an imaginary part of X_k, respectively.

Claim 5 (Canceled)